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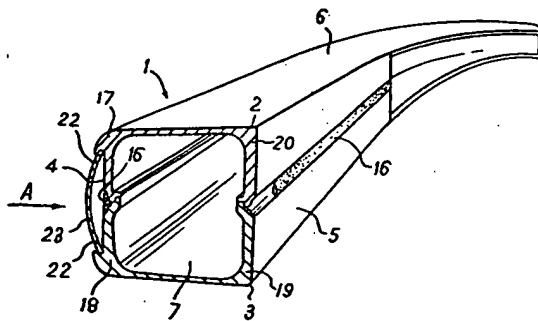
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BRHA ★ Q17 A3309A/02 ★ GB 1497438  
 Impact-absorbing box-section buffer - comprises two channel  
 sections welded together with thick front and rear walls  
 BRITISH ALUMINIUM LTD 19.03.75-GB-011468  
 (12.01.78) B60r-19/02

An impact-absorbing buffer, esp. for use as a vehicle bumper, is of box section over a major part of its length. The box section is formed of two similar channel sections (2, 3) welded together.

The walls of the buffer which in use are the front and rear walls (4, 5) are stiffer than the remaining walls (6, 7), so that upon impact on the front wall of a magnitude sufficient to distort the buffer, the remaining walls will



buckle prior to any substantial distortion of the front and rear walls. The corners of the channel sections are pref. thickened to provide additional stiffness.

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(54) IMPROVEMENTS RELATING TO AN IMPACT  
ABSORBING BUFFER

(71) We, THE BRITISH ALUMINIUM COMPANY LIMITED, a Company registered under the laws of Great Britain, of Norfolk House, St. James's Square, London, S.W.1. do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to an impact absorbing buffer and is particularly although not exclusively concerned with a vehicle bumper.

The appropriate authorities in a number of countries now set specific standards for impact absorption by vehicle bumpers and their mountings. One such regulation, for example, requires a bumper together with its mounting to accommodate without damage to the bumper or the vehicle a direct impact with an immovable object when the vehicle is travelling at 5 m.p.h. It is therefore necessary to use sophisticated energy absorbing mountings to prevent damage to the vehicle and it also requires specially designed bumpers to enable an impact up to a pre-determined magnitude to be transmitted to the mounting without distortion of the bumper structure. It is also desirable, when a bumper receives a greater impact that it should distort progressively in such a manner as to assist its energy absorbing mounting to accommodate the impact with a minimum amount of damage to the vehicle.

It is accordingly an object of the present invention to provide an impact absorbing buffer having pre-determined stiffness characteristics and capable of progressive distortion under increasing impact load and which is of comparatively light weight so as to be particularly although not exclusively suitable for use as a vehicle bumper.

A further object of the present invention is to provide such a buffer as a vehicle

bumper which may readily be constructed with integrally formed "wrap around" ends.

According to one aspect of the present invention there is provided an impact absorbing buffer which is of box section over at least the major part of its length and comprises two generally similar channel sections longitudinally welded together, those walls of the buffer which, in use, are to constitute front and rear walls being stiffer than the remaining walls so that upon receipt of an impact on the front wall of a magnitude sufficient to distort the buffer said remaining walls will buckle prior to any substantial distortion of the front and rear walls. Preferably the channel sections are welded together along the front and rear walls. The front and rear walls may also be of greater thickness than the remaining walls and the corners of the channel sections may be thickened to provide additional stiffness. Additionally the remaining walls may incline towards one another in the direction from the back to the front walls.

The outer edges of the channel sections may be stepped so that the sections are butt welded together and the front wall may be formed with opposed recesses to receive a decorative panel hiding the front wall weld seam. Preferably the sections are extruded from an aluminium/magnesium/zinc alloy and register with one another to provide an accurately aligned structure prior to welding. The alloy is preferably of at least 18 tons/sq. in. proof stress.

When the buffer is to constitute a vehicle bumper with its ends "wrapped around" a vehicle the rear wall may be cut away at each end of the bumper, the remaining walls are tapered from the rear and the ends are curved by wrap or stretch bending.

According to another aspect of the present invention there is provided a vehicle bumper which is of box section over a

central straight part of its length and has curved ends and which comprises two generally similar channel sections longitudinally welded together along front and rear walls 5 which are each of greater thickness than the remaining walls, the corners of the channel sections being thickened, the rear wall of the bumper being cut away over its curved ends so that these ends are of channel section and the remaining walls being tapered over the curved ends and inclining towards one another in the direction from the back to the front wall.

One embodiment of the present invention will now be described by way of example with reference to the drawing accompanying the Provisional Specification in which:

Fig. 1 shows a cut-away perspective view of a vehicle bumper and

Fig. 2 shows in section and to an enlarged scale a detail of the bumper structure.

Referring to figure 1 a vehicle bumper indicated generally at 1 comprises two channel section members 2 and 3 welded together to present a box section having front and rear walls 4 and 5 and top and bottom walls 6 and 7. The members 2 and 3 are extruded from an aluminium alloy such as that sold by the applicant company under the reference H17 which is an aluminium/magnesium/zinc alloy of at least 18 tons per square inch proof stress. The extrusions are shaped so that they mate accurately together in order to facilitate an accurate welding operation.

Figure 2 shows a detail of the rear wall 5 of the bumper and it will be seen that the part 2 has an inwardly directed flange 8 spaced upwardly from its outer extremity 9 and the latter lodges in a groove 10 formed in the face 11 of an inwardly inclined lip 12 on the part 3. The upper end 13 of the lip lodges against the under surface of the flange 8. Externally of the groove 10 the parts 2 and 3 are similarly cut away and chamfered at 14 and 15 to provide a groove for receiving a weld seam 16. It will be understood that with this arrangement the parts 2 and 3 may be accurately located together for the welding operation and the weld seam 16 effectively constitutes a butt weld between these parts. It will also be understood that although in figure 2 the weld seam is shown as merely filling the cut away portions of the parts 2 and 3 the surfaces of the latter will fuse during the welding operation. The configurations on the parts 2 and 3 forming the front wall 4 are similar but of opposite hand.

As shown in figure 1 the front and rear walls 4 and 5 are of considerably greater thickness than the top and bottom walls 6 and 7 and furthermore the corners 17, 18, 19 and 20 are additionally thickened. This

arrangement ensures that the front and rear walls are particularly stiff and unyielding in response to an impact in the direction of the arrow A. Although the top and bottom walls 6 and 7 are of thinner material they are presented "edge on" to an impact in the direction of the arrow A and consequently also contribute to the rigidity of the entire box section. This rigidity is further enhanced since the top and bottom walls 6 and 7 incline slightly towards one another from the rear wall 5 to the front wall 4.

The box section of the bumper extends only over a central portion thereof and at its ends the bumper is curved to "wrap around" the rear corners of a vehicle. One such end is shown as 21 in figure 1 and it will be seen that the entire rear wall 5 is cut away so leaving this end of C-shape channel section. It is found that the end 21 may be satisfactorily bent to the desired shape using suitably designed rollers and anvils with a known stretch bending technique.

The front face 4 of the bumper is further formed at its corners with recesses 22 to receive a decorative strip 23 of rubber, plastics or metal to hide the welded seam 16 in the front face.

By using the alloy described above it is possible to fabricate the bumper shown in figures 1 and 2 requiring the provision of two weld seams and extensive wrap or stretch bending and then subsequently heat treat and artificially age the fabricated bumper to reproduce the original properties of the alloy used.

In practice the bumper will be mounted upon energy absorbing mounts (not shown) secured to a vehicle chassis or under frame. It has been found that a bumper constructed as described can transmit, without itself suffering deformation, a considerable impact load to the energy absorbing mounts. For example with a bumper of the alloy mentioned and in which the box section is approximately  $4\frac{1}{2}$  inches by  $3\frac{1}{2}$  inches with the thickness of the front and rear walls of 0.15 inches and the thickness of the top and bottom walls of 0.10 inches and with the bumper secured to a vehicle weighing 2 tons via a suitable mounting an impact with a stationary object at a speed of  $5\frac{1}{2}$  m.p.h. can be sustained without damage either to the bumper or the vehicle.

It has also been found that with a particular vehicle for which an energy absorbing bumper system could weigh 120 lbs. a system according to the present invention can weigh less than 70 lbs.

In addition the particular construction of the box section of the bumper presents special advantages at higher impact loads since the bumper is capable of assisting its

mountings to absorbing energy and so minimise damage to a vehicle in a collision. Although the strength and disposition of the upper and lower walls presents a pre-determined stiffness against a particular impact load, should this load be exceeded these walls will crumple progressively whereas the front and rear walls tend to remain undeformed in view of the stiffness provided to them firstly by their thickness and also by the strength imparted by the corners of the box section and the weld seams.

Although the arrangement described above presents the most desirable characteristics for a vehicle bumper it will be understood that the weld seams could be located in the top and bottom walls 6 and 7. This would facilitate the bending of the "wrap around" ends of the bumper but would be disadvantageous for the strength characteristics set out above and would also be aesthetically less pleasing since the strip 23 would need to be along the upper wall of the bumper to hide the weld seam therein.

#### WHAT WE CLAIM IS:—

1. An impact absorbing buffer which is of box section over at least the major part of its length and comprises two generally similar channel sections longitudinally welded together, those walls of the buffer which, in use, are to constitute front and rear walls being stiffer than the remaining walls so that upon receipt of an impact on the front wall of a magnitude sufficient to distort the buffer said remaining walls will buckle prior to any substantial distortion of the front and rear walls.

2. A buffer according to claim 1 in which the channel sections are welded together along the front and rear walls.

3. A buffer according to claim 1 and claim 2 in which the front and rear walls are of greater thickness than the remaining walls and the corners of the channel sections are thickened to provide additional stiffness.

4. A buffer according to claim 3 in which the remaining walls incline towards one another in the direction from the back to the front walls.

5. A buffer according to any one of the

preceding claims in which the outer edges of the channel sections are stepped so that the sections are butt welded together and the front wall is formed with opposed recesses to receive a decorative panel hiding the front wall weld seam.

6. A buffer according to any one of the preceding claims in which the sections register with one another to provide an accurately aligned structure prior to welding.

7. A buffer according to any one of the preceding claims in which the sections are extruded from an aluminium/magnesium/zinc alloy.

8. A buffer according to claim 7 in which the alloy is of at least 18 tons/sq. in. proof stress.

9. A buffer according to any one of the preceding claims in which the rear wall is cut away at each end of the buffer, the remaining walls are tapered from the rear and the ends are curved by wrap or stretch bending so as to provide a vehicle bumper capable of having its ends "wrapped around" a vehicle.

10. A vehicle bumper which is of box section over a central straight part of its length and has curved ends and which comprises two generally similar channel sections longitudinally welded together along front and rear walls which are each of greater thickness than the remaining walls, the corners of the channel sections being thickened, the rear wall of the bumper being cut away over its curved ends so that these ends are of channel section and the remaining walls being tapered over the curved ends and inclining towards one another in the direction from the back to the front wall.

11. An impact absorbing buffer substantially as herein described with reference to Figure 1 and Figure 2 of the drawing accompanying the provisional specification.

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FIG. 1

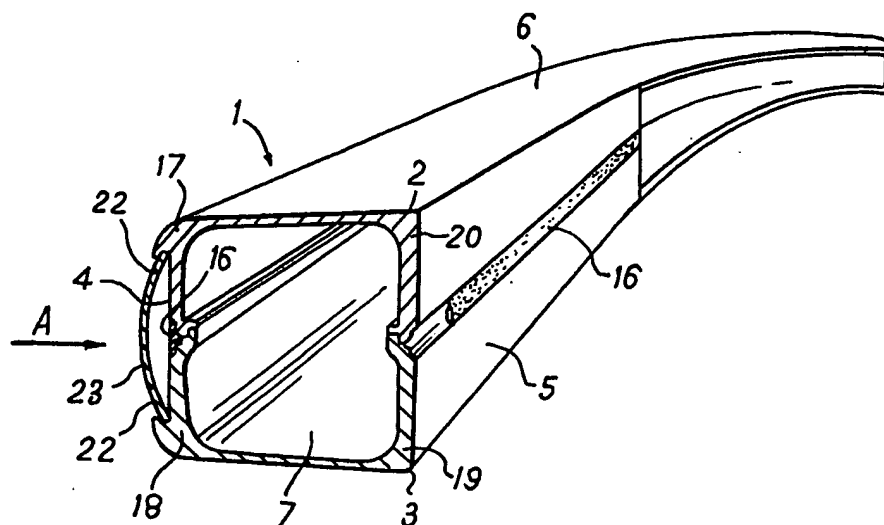


FIG. 2

